REMARKS

The Office Action dated January 24, 2007, has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

Claims 1-63 are currently pending in the application, of which claims 1-3, 25, 32, 44, 51, and 63 are independent claims. Claims 3, 32, 51, and 63 been amended to more particularly point out and distinctly claim the invention. No new matter has been added. Claims 1-63 are respectfully submitted for consideration.

Claims 3, 25-41, 43-47, and 39-62 were rejected under 35 U.S.C. 112, first paragraph, as allegedly failing to comply with the written description requirement. Applicant respectfully traverses this rejection.

Claim 3 was rejected because "with previously known weights that compensate for the primary weights to form a compensating radiation pattern" allegedly was not supported by the original specification. Similar language, however, was found in original claim 2, which is part of the specification for purposes of support under 35 U.S.C. 112, first paragraph. Claim 3 originally depended from claim 2, and the allegedly objectionable language is clearly a combination of "weighting ... with weights which compensate to form a compensating radiation pattern" in original claim 2 and "weighting signals ... with previously known weights." Claim 3 originally depended from and therefore incorporated all of the limitations of claim 2. Accordingly, Applicant respectfully submits that the recitation in claim 3, "with previously known weights that

compensate for the primary weights to form a compensating radiation pattern" is clearly supported by the original specification as filed.

Additional support for the amendment can be found, at least, at page 15, line 4, *et seq.*, particularly lines 4-6, which states that "the compensating radiation pattern 700 is formed by weighting signals of functional antenna branches 310A, 310B by previously known weights." Accordingly, it is respectfully requested that this rejection be withdrawn.

Claim 25 was rejected because the feature "configured to form" allegedly was not supported by the original specification. Original claim 25 recited "a base station (204) for forming a radio interface of the radio system." "For forming" fully supports "configured to form." The rejection is not explained, which – by itself – is a sufficient reason why the rejection to be withdrawn. Furthermore, the rejection appears to be based on the fact that the precise words "configured to form" were not used.

Section 112 of the Patent Act states that the "specification shall contain a written description of the invention." 35 U.S.C. §112. The Federal Circuit has held that "[t]o fulfill the written description requirement, the patent specification must describe an invention in sufficient detail that one skilled in the art can clearly conclude that the inventor invented what is claimed." *Cordis Corp. v. Medtronic AVE, Inc.*, 339 F.3d 1352, 1364, 67 USPQ2d 1876, 1885 (Fed. Cir. 2003).

The Federal Circuit has explained, however, that "[t]he disclosure as originally filed does not … have to provide in haec verba support for the claimed subject matter at

issue." *Id.* See additionally, *Kao Corp. v. Unilever United States, Inc.*, 78 USPQ2d 1257, 1260 (Fed. Circ. March 21, 2006). In other words, there is no requirement that the precise recitations used in the claims appear in the specification, in order to satisfy the written description requirement. The concept claimed is fully supported in the specification, in such a way that one of ordinary skill in the art could clearly conclude that the inventor invented what is claimed. Therefore, the claims fully comply with the written description requirement.

Likewise claims 26-41, 43-47, and 49-62 were rejected based on the presence of "configured to form a fixed ..." "configured to transmit ..." "configured to weight ..." and "configured to disconnect ..." and these rejections are improper for the same reasons the rejection of claim 25 is improper. There is full support for the recited features, and there is no need for the exact words "configured to" to be present in the original specification as a prerequisite to using such recitations to claim the invention. Accordingly, it is respectfully request that these rejections be withdrawn.

Claims 1-63 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,735,182 of Nishimori et al. ("Nishimori") and U.S. Patent No. 5,784,031 of Weiss et al. ("Weiss"). The Office Action took the position that Nishimori teaches all of the elements of independent claims 1-3, 25, 32, 44, 51, and 63 except "disconnecting at least one antenna branch." The Office Action supplied Weiss to remedy the deficiencies of Nishimori. Applicant respectfully traverses this rejection.

Claim 1, upon which claims 5-24 depend, is directed to a method of compensating for a radiation pattern in a radio system. The method includes forming a primary radiation pattern by weighting signals of at least two functional antenna branches of a base station. The method also includes disconnecting at least one antenna branch. The method additionally includes forming a radiation pattern that compensates for the primary radiation pattern by weighting signals of the functional antenna branches.

Claim 2, upon which claims 4-12 depend, is directed to a method of weighting signals in a radio system. The method includes weighting signals of at least two functional antenna branches of a base station with primary weights to form a primary radiation pattern. The method also includes disconnecting at least one antenna branch. The method further includes weighting signals of the functional antenna branches with weights that compensate for the primary weights to form a compensating radiation pattern.

Claim 3 is directed to a method of weighting signals in a radio system. The method includes weighting signals of at least two functional antenna branches of a base station with primary weights to form a primary radiation pattern. The method also includes disconnecting at least one antenna branch based on a command indicating a fault in an antenna element, antenna feeding cable, or power amplifier. The method further includes weighting signals of the functional antenna branches with previously known weights that compensate for the primary weights to form a compensating radiation pattern.

Claim 25, upon which claims 26-31 and 33-43 depend, is directed to a radio system including a base station configured to form a radio interface of the radio system. The base station includes at least two antenna branches for establishing a radio link to terminals. Each antenna branch includes at least one antenna element configured to form an antenna array. The base station includes weighting means for weighting signals of the functional antenna branches configured to form a primary radiation pattern. The base station is configured to disconnect at least one antenna branch. The weighting means are configured to weight signals of the functional antenna branches to form a radiation pattern that compensates for the primary radiation pattern.

Claim 32 is directed to a radio system including a base station configured to form a radio interface of the radio system. The base station includes at least two antenna branches for establishing a radio link to terminals. Each antenna branch includes at least one antenna element configured to form an antenna array. The base station includes weighting means for weighting signals of the functional antenna branches configured to form a primary radiation pattern. The base station is configured to disconnect at least one antenna branch based on a command indicating a fault in an antenna element, antenna feeding cable, or power amplifier. The weighting means is configured to weight signals of the functional antenna branches with previously known weights to form a radiation pattern that compensates for the primary radiation pattern.

Claim 44, upon which claims 45-50 and 52-62 depend, is directed to a base station of a radio system includes at least two antenna branches for establishing a radio link to

terminals, each antenna branch comprising at least one antenna element for forming an antenna array. The base station also includes weighting means for weighting signals of the functional antenna branches to form a primary radiation pattern. The base station is configured to disconnect at least one antenna branch. The weighting means are configured to weight signals of the functional antenna branches to form a radiation pattern that compensates for the primary radiation pattern.

Claim 51 is directed to a base station of a radio system. The base station includes at least two antenna branches for establishing a radio link to terminals, each antenna branch comprising at least one antenna element for forming an antenna array. The base station also includes weighting means for weighting signals of the functional antenna branches to form a primary radiation pattern. The base station is configured to disconnect at least one antenna branch based on a command indicating a fault in an antenna element, antenna feeding cable, or power amplifier. The weighting means is configured to weight signals of the functional antenna branches with previously known weights to form the compensating radiation pattern.

Claim 63 is directed to a method of compensating for a radiation pattern in a radio system. The method includes forming a primary radiation pattern by weighting signals of at least two functional antenna branches of a base station. The method also includes disconnecting at least one antenna branch based on a command indicating a fault in an antenna element, antenna feeding cable, or power amplifier. The method additionally

includes forming a radiation pattern that compensates for the primary radiation pattern by weighting signals of the functional antenna branches with previously known weights.

Certain embodiments of the present invention relate to a technique for compensation of a radiation pattern in a radio system. The compensation is obtained by preliminarily forming a primary radiation pattern by weighting signals of at least two functional antenna branches of a base station. Then, at least one antenna branch is disconnected and a radiation pattern is formed which compensates for the primary radiation pattern by weighting signals of the functional antenna branches.

Thus, such embodiments of the present invention can advantageously solve a problem related to interference directed at antenna branches and caused, for example, by supply electronics, as explained in more detail in the "BACKGROUND" section of the present application.

Applicant respectfully submits that the combination of Nishimori and Weiss does not disclose or suggest all of the elements of any of the presently pending claims, and thus cannot provide that above-described critical and unobvious advantages.

The Office Action, in the "Response to Arguments" section fails meaningfully to address these critical and unobvious differences (which were previously brought to the attention of the USPTO, in the Response filed on December 4, 2006) between the cited references and the present application. Accordingly, Applicant respectfully submits that the critical and unobvious distinctions provide a basis for rebutting the Office Action's case for obviousness of the claims. Furthermore, because the critical and unobvious

differences are not addressed by the Office Action, there is no basis for maintaining the rejection, and it is respectfully requested that the rejection be withdrawn.

That is not to say that the Office Action, in the Response to Arguments section, does not note this argument and provide comments. However, at page 4, the Office Action's response that "The Examiner respectively [sic] disagree, [sic as to both errors] that the claimed invention (limitations) was not specifically claimed as detail as [sic] in the "background or specification" [sic] of the present application." This response is not clear and, thus, cannot be considered a meaningful response to the critical and unobvious advantages argument presented above.

Nevertheless, according to Applicant's best guess as to what the Office Action intended to say, the Office Action appears to be stating that Applicant has tried to import limitations from the Background into the claims. Indeed, the Office Action's subsequent comment, "The Examiner has considered the claimed invention was broader, [sic] unless more specific claimed [sic]," seems to confirm this best guess.

This position, however, is totally incorrect. Applicant's reference to the Background section was simply to point out problems that certain embodiments of the present invention advantageously solve, not to import limitations from the specification into the claims. Accordingly, it appears that the Office Action simply reflects a fundamental misunderstanding of Applicant's argument. It is respectfully requested that, in view of the clarification of this argument presented above, the rejection be withdrawn.

The remainder of the Office Action's comments on page 4 of the Office Action, and continuing to the end of the first partial paragraph of page 5 of the Office Action simply asserts that the combination of the references discloses all of the limitations of the claims. Nevertheless, the combination of cited references do not disclose or suggest all of the limitations of any of the presently pending claims.

Nishimori generally relates to an adaptive array antenna system. Nishimori's adaptive array antenna system aims to calibrate, automatically, both amplitude and phase of each array antenna element during communication, as explained at column 1, lines 5-11. As can be seen from Figure 13 and at column 1, lines 48-53, Nishimori's system includes antenna elements 13-1-1 to 13-1-N, each coupled with transmitters 13-1-1 to 13-1-N or receivers 13-4-1 to 13-4-N through transmit/receive switches 13-2-1 to 13-2-N.

Nishimori, thus, describes a calibration system. However, Nishimori fails to relate the calibration system to compensation of a radiation pattern. Therefore, a person of ordinary skill in the art would not have used teaching of Nishimori in order to solve the problem discussed above. If one of ordinary skill in the art used the teachings of Nishimori, the result would still be restricted to a calibration of an antenna array, not to compensation of a radiation pattern.

The Office Action, in the Response to Arguments section, replied that Nishimori does disclose that "the calibration on [sic] transceiver ... can be compensated [sic] of [sic] a radiation pattern." The Office Action cited column 15, and column 16, "lines 39-7 [sic]."

The cited portion of Nishimori in column 16 simply indicates that radiation pattern control calculation circuit (2-10) can control a radiation pattern by applying weighting signals. Furthermore, in column 15, Nishimori does mention compensation and compensation for: amplitude error, phase error, and temperature characteristics. Nishimori also mentions calibration values. However, Nishimori does not relate the calibration values to the compensation for the various error sources. Instead, as noted above, Nishimori compensates for those various error sources through the use of multiplier circuit 9-11, as can be seen from column 15, lines 41-55.

The Office Action also cited Figures 2 and 6 (and their corresponding description). However, these figures again do not relate the calibration to the compensation, despite the Office Action's comments which, while difficult to understand, appear to be to the contrary.

As previously explained to the USPTO, the problem cited by Nishimori is the interference from adjacent cell, as can be seen at column 1, lines 28 and 29 of Nishimori. The problem is solved by calibrating an antenna array. Therefore, one of ordinary skill in the art would not have taken Nishimori as an information source for solving the problem described above. Nishimori cannot be interpreted, either alone or combined with Weiss, as disclosing or suggesting the elements of the presently pending claims. Thus, Nishimori cannot provide the above-described critical and unobvious advantages.

The Office Action's Response to Arguments section does not reflect that these arguments were considered. Instead, the Office Action's Response to Arguments section

appears to repeat substantially the same language as previously addressed by Applicant in previous responses to Office Actions. Accordingly, it is impossible for Applicant to determine any basis upon which the Office Action fails to accept the distinctions provided by Applicant. Nevertheless, real and significant differences exist between the cited art and what is claimed.

As explained at column 1, lines 54-65 of Nishimori, a receive signal is applied to a receiver through an antenna element and a transmit/receive switch. An output of the receiver is applied to a radiation pattern control calculation circuit 13-7 that calculates amplitude and phase of each channel. A weight multiplier circuit 13-6 multiplies the amplitude and phase of a signal to be transmitted, and the product of the multiplication is applied to antenna elements through transmitters and transmit/receive switches. The amplitude and the phase of the antenna elements are controlled by the weight multiplier circuit so that a desired shape of an antenna beam is obtained.

Further, as can be seen at Figure 12 and column 2, line 64, to column 3, line 13, of Nishimori, the system comprises a reference signal generator 12-11 that sends a signal, which is common to all the branches, to receiver 12-3 through a separator 12-14a. An adjusted value for each receiver is determined based upon a value received in each receiver and a reference value that is a received value by a specific receiver. A transmitter 12-4 sends a signal to a receiver through a switch 12-13 and an attenuator 12-12. The adjusted value is obtained by an output of each receiver, and a reference value of a reference receiver that is defined in the process. Thus, the amplitude and phase

of each branch of an antenna array can be adjusted by using only a communication apparatus, according to Nishimori.

However, as the Office Action correctly observed, Nishimori fails to disclose or suggest "disconnecting at least one antenna branch" (as recited by claim 1) and "wherein the base station is arranged to disconnect at least one antenna branch" (as recited by claims 25 and 44). In order to remedy these deficiencies, the Office Action supplied Weiss. Weiss, however, does not remedy these deficiencies.

Weiss generally relates to versatile antenna array for multiple pencil beams and allegedly efficient beam combinations. Weiss, as explained at column 2, lines 9-24, generally discloses a base station including an antenna array that can be used to generate multiple well separated pencil radiation beams. Alternatively, as explained at column 2, lines 25-36, these beams can be combined, without a significant loss, to create a wide angle beam, because non-orthogonal beams may be combined without significant field cancellation. The result is a single antenna array that can be used to transmit or receive different information on different beams at the same frequency or, alternatively, it can be used for transmitting exactly the same information on all beams or on several beams that cover a sector, as explained at column 2, lines 1-8.

As can be seen from Figures 3A, 3B and 4 as well as column 4, line 29 to column 4, line 43 of Weiss, a beam-forming network 308 has 32 inputs 402 and 32 outputs 404. Each output 404 corresponds to an antenna element 202. Each input corresponds to the signal for a beam of a particular multi-element antenna array 108. An example of this

can be seen in Figure 1B. The beams closest to the center of the 120 degree radiation pattern sector developed by a particular multi-element antenna array have their inputs labeled "L1" and "R1," respectively.

Weiss indicates, at column 5, lines 15-27, that the inputs for beams "L15," "L16," "R15," and "R16" are preferably left disconnected since these outermost beams would be attenuated. However, Weiss is silent as to disconnecting any antenna branches, or that such disconnecting at least one antenna branch is based on a command indicating a fault in an antenna element, antenna feeding cable, or power amplifier.

Instead, in Weiss, inputs for beams "L15", "L16", "R15", and "R16" are left disconnected since these outermost beams would be attenuated. Thus, in Weiss, any "disconnection" of the inputs for the specific beams is aimed at reducing the attenuation of the outermost beams. Therefore, the non-connection proposed by Weiss is based on a deterministic reason, whereas – as reflected, for example, in claims 3, 32, 51, and 63 – the disconnection of the antenna beams as claimed is based on a failure in an antenna element, antenna feeding cable, or power amplifier.

Moreover, Weiss fails to disclose the primary radiation pattern be compensated by weighting signals of the functional antenna branches. In Weiss, the non-connection of the inputs for the specific beams is aimed at reducing the attenuation of the outermost beams. Indeed, the problem cited by Weiss is to segregate groups of user stations in the spatial domain. The problem is solved by applying 180 degree phase shift for every other beam in a radiation pattern, as explained at column 8, lines 36-52 of Weiss. In certain

embodiments of the present invention, in contrast, the disconnected antenna branches can be selected on a random basis based, for example on the interference in the supply electronics of the antenna branches, which interference is not thought to be a deterministic occurrence. As a result, the solution of Weiss would not solve the problem cited in the present application and, thus, cannot achieve the above-identified critical and unobvious advantages. Instead, Weiss would aggravate the problem, since the antenna capacity would not fully be used.

Furthermore, if one of ordinary skill in the art were attempting to solve the problem identified by Weiss, the solution of Weiss would suggest disconnecting the specific signals related to the outermost beams. Thus, in the case of a failure of an antenna element, antenna feeding cables or power amplifiers, the solution of Weiss would not work to address such a failure, but would even worsen the situation. In the teaching of Weiss, in addition to any malfunctioning antenna branch, possibly operable antenna branch(es) would be disconnected. Therefore, one of ordinary skill in the art would not be motivated to apply teachings of Weiss for solving a problem relating to antenna element failure.

If one of ordinary skill in the art combined Nishimori and Weiss, the result would still be a calibration system that utilized a beamforming array of Weiss with erroneously disconnected antenna signals. The combination would, therefore, differ from that defined by the independent claims of the current application. The combination would be restricted to the disconnection of the specific, *i.e.* outermost, antenna signals and there

would be no intention to compensate the radiation pattern, *i.e.* the primary radiation pattern, that was obtained before the disconnection of the specific antenna signals.

Indeed, Weiss does not specifically teach "disconnecting" at least one antenna branch, but only that the inputs for several particular beams are "left disconnected." Leaving something disconnected is different from disconnecting something. That this is a significant difference becomes clear when "compensating" is properly understood. If a primary radiation pattern is to be compensated for after the disconnection of at least one antenna branch, that branch cannot simply be "left disconnected" there must actually be "disconnecting" that occurs. Accordingly, it is respectfully submitted that Weiss does not and cannot remedy the deficiencies of Nishimori by teaching "disconnecting at least one antenna branch" (as recited by claim 1) and "wherein the base station is arranged to disconnect at least one antenna branch" (as recited by claims 25 and 44).

The Office Action, in the Response to Arguments section, replied that "Weiss specifically disclose [sic] one input (one antenna branch) are [sic] disconnected by multi element antenna array (Please see detail in col. 4 through col. 5, lines 13-62) and applicant's specification on page 14." Applicant respectfully disagrees with the Office Action's position, as best understood.

In fact, the cited portion confirms exactly what Applicant already asserted, namely that in Weiss, the branches are not "disconnected" (as claimed) but are "left disconnected" column 5, lines 22-24. It appears that the Office Action has simply overlooked the clear statement by Weiss that the inputs are "left disconnected" or has not

acknowledged the difference between leaving antenna branch disconnected (i.e. leaving an unconnected branch in an unconnected state), and disconnecting a branch (i.e. moving a branch from a connected to state an unconnected state). It is respectfully submitted that the Office Action's explanation of Weiss constitutes clear error, because Weiss does not teach "disconnecting" but rather that inputs for certain beams are "left disconnected" as clearly stated at column 5, lines 22-24 of Weiss. It is, therefore, respectfully requested that the rejection of claims 1-3, 25, 32, 44, 51, and 63 be withdrawn.

Furthermore, claims 3, 32, 51, and 63 recite that "weighting signals of the functional antenna branches with previously known weights" as part of the compensation. Applicant respectfully submits that the combination of Nishimori and Weiss also fails to disclose or suggest at least this feature of the claims.

Nishimori, for example, discloses instead a calibration procedure, in which the weights are calculated according to a calibration result, which depends on the current environment (such as temperature variation during communication and/or change of location of base stations) as explained at column 3, lines 19-21. Nishimori further discuses that its solution provides the calibration values by using an actual transmission signal, and that, therefore, the calibration is carried out on a real time basis during actual communication, as explained at column 1, lines 50-53.

Accordingly, Nishimori teaches away from using previously known weights to form a radiation pattern that compensates for a primary radiation pattern.

Furthermore, according to Nishimori, an amplitude/phase calibration value C is calculated as a ratio of receiver outputs A and B, when a transmitter output is applied to the receiver, as explained at column 4, line 61, to column 5, line 7. Furthermore, Nishimori describers its calibration procedure this way: "the weight multiplier circuit 2-11 multiplies the calibration value thus obtained and the amplitude/phase value of the receive signal, and the transmission is carried out by using the product of said multiplication. Thus, the calibration among the branches of an array antenna is carried out in a transmitter/receiver itself, and an excellent transmission is provided as if no amplitude difference and no phase difference among the branches existed. Thus, according to the present invention, an amplitude and phase among branches are calibrated." Column 10, lines 40-48.

Nishimori's description of the calculation of the amplitude/phase calibration value C and the use of the amplitude/phase calibration value C in transmission evidently indicates that Nishimori does not teach the use of previously known weights, since previously known weights cannot possibly be used in the calibration procedure disclosed by Nishimori. Furthermore, Weiss does not remedy Nishimori's deficiencies, or overcome Nishimori's teachings away from the claimed invention. It is, therefore, respectfully requested that the rejection of claims 3, 32, 51, and 63 be withdrawn.

Claims 3, 32, 51, and 63 additionally recite that the claimed disconnecting is "based on a command indicating a fault in an antenna element, antenna feeding cable, or

power amplifier." The cited references clearly fail to disclose or suggest at least these features of the claimed invention.

Regardless of whether the Office Action's other characterizations are correct, the only basis for lack of connection of antenna elements in the cited references is predicted attenuation on the outermost elements, not a command indicating a fault, and certainly not a command indicating a fault in an antenna element, antenna feeding cable, or power amplifier. Accordingly, the cited combination of references clearly fails to disclose or suggest these features of claims 3, 32, 51, and 63, and it is respectfully requested that the rejection be withdrawn.

Claims 4-24, 26-31, 33-43, 45-50, and 52-62 depend respectively from, and further limit, claims 1, 2, 25, and 44. Therefore, it is respectfully submitted that each of claims 4-24, 26-31, 33-43, 45-50, and 52-62 recites subject matter that is neither disclosed nor suggested in the combination of cited references. Thus, it is respectfully requested that the rejection of all of claims 1-63 be withdrawn.

For the reasons explained above, it is respectfully submitted that each of claims 1-63 recites subject matter that is neither disclosed nor suggested in the cited art. It is, therefore, respectfully requested that all of claims 1-63 be allowed, and that this application be passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by

telephone, Applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, Applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

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